Earth's Paleobiosphere

ES-6 The student will demonstrate an understanding of the dynamic relationship between Earth's conditions over geologic time and the diversity of its organisms.

Key Concepts for ES-6:
Planet conditions: hydrosphere, atmosphere, biosphere
Geologic time: geologic time scale – eons, eras, periods, epochs; complexity & diversity of life
Fossil evidence: types of fossils within various environments
Geologic dating methods: index fossils, relative dating, radiometric dating
Age of universe & Earth: cosmology

ES-6.1 Summarize the conditions of Earth that enable the planet to support life.
Taxonomy level: 2.4-B Understand Conceptual Knowledge

Previous/future knowledge: Students have studied throughout elementary grades the needs that plants and animals must have in order to survive and reproduce. In 6th grade students summarized characteristics that all organisms share, such as the obtainment and use of resources for energy, which they would get from the environment. In 7th grade students studied the biotic and abiotic environment of Earth and how organisms interacted and responded to the components of the environment. In Earth Science students will focus on Earth as the unique planet with the conditions that can support life.

It is essential for students to know that without Earth's hydrosphere, atmosphere, and environments of the biosphere, life could not exist on Earth.

- Earth is suitable for life because of its unique orbital position that allows for water to exist in all three phases on the surface. Water makes Earth unique. The *hydrosphere*, Earth's mass of liquid water that is constantly on the move, is vital to life within it and also to life on the land.
- Earth is surrounded by a life-giving gaseous envelope called the *atmosphere*. Earth's atmosphere provides the air that organisms need to breathe and also acts to protect organisms from the Sun's intense heat and radiation.
- The *biosphere* includes all life on Earth – life found from the depths of the ocean floor to life existing in the lower atmosphere. This biosphere contains the biotic and abiotic environments necessary for organisms to breathe, obtain/make food, find shelter, and reproduce. Organisms not only respond to the environmental conditions on Earth, but through interactions, they help maintain and alter the environment also.

Scientists examine evidence from the rock record and fossils to develop their theories about the existence of life and the changes in Earth's conditions. During the formation of these spheres of Earth, scientists have found evidence that life forms went through many changes in order to exist. Geologic changes, changes in the amount of Earth's surface water, changes in the atmosphere resulting in climatic changes and temperature changes have affected the life forms in existence throughout the history of Earth.

It is not essential for students to know evolutionary theory with this indicator; students are focusing on Earth conditions for survival, not natural selection and organism change over time.

Assessment Guidelines:
The objective of this indicator is to *summarize* the conditions on Earth that are necessary for the support of life; therefore, the primary focus of assessment should be to generalize major points about how Earth as a planet meets of the needs of living things.
In addition to *summarize* appropriate assessments may require students to:

- *infer* how the hydrosphere or atmosphere or biosphere gives Earth life-sustaining properties; or
- *identify* the spheres of Earth necessary for life on the planet.